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**ABSTRACT**

5 A liner, blank or sheet (1,11,12,21,30,70) of compressed sphagnum moss (54) having a moisture content such that the liner, blank or sheet is pliable to the extent that it is able to be folded and unfolded with minimal or no degradation to the fibre integrity, wherein the liner, blank or sheet of compressed sphagnum moss is provided with means to minimise moisture loss. A method of constructing such a liner blank or sheet is also provided

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PATENTS ACT, 1990

COMPLETE SPECIFICATION

FOR A STANDARD PATENT

ORIGINAL

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Invention Title: PLANT CONTAINER LINERS

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The following statement is a full description of this invention, including the best method of performing it known to me/us

## PLANT CONTAINER LINERS

### **Field of the Invention**

5 This invention relates to plant container liners or blanks therefor or sheets of sphagnum moss. In particular, although not exclusively, the invention relates to sphagnum moss liners for plant containers such as hanging baskets, especially those baskets in the form of skeletal containers.

### **Background to the Invention**

10 Because of its unique water retaining properties, and pleasant appearance as a natural plant substance, sphagnum moss has traditionally been a favoured material for use in conjunction with floral arrangements and related horticultural activities.

15 Traditionally, sphagnum moss has been sold mostly in a dried state but sometimes in a wet state, but generally in a natural loose form in which each filament of the moss plant is separate and distinguishable.

20 In recent decades, a new technology has developed in the sphagnum moss industry. This is the use of pressure to compress the loose moss in a press into compact sheet form. These sheets are of various thickness, usually from 2 or 3 mm to about 7 mm. They are somewhat like cardboard in flexibility and look somewhat like particle board in texture.

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In its traditional loose form, sphagnum moss has always been associated with hanging baskets. One reason for this is its particular ability to absorb and retain water up to and exceeding 20 times its own weight. Another is its natural and aesthetically pleasing appearance.

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The most common traditional method of using sphagnum moss to line hanging baskets is to place some loose moss in the bottom of a wire hanging basket, then cover the moss with a little potting mix. After this the basket is gradually filled, firstly by building up the outer layer of sphagnum moss around the outside of the basket and secondly by holding it in place with a little more soil and potting mix. This process is repeated several times until the lining of sphagnum moss reaches right to the upper rim of the hanging basket.

35 This is obviously a very labour intensive task. For this reason it has mostly been performed at home by the enthusiastic gardener, and by staff in some garden centres. In this form, hanging baskets with a layer of sphagnum moss directly inside the wire basket

It is evident that there is an extremely limited scope for selling sphagnum moss lined hanging baskets in this form. The labour content in filling them is very high. In addition the basket would need to be regularly watered to keep the potting mix and the sphagnum moss moist.

For these reasons, sphagnum lined hanging baskets filled in this way would normally have to be made and sold in the same garden centre. Such articles could not be manufactured on a large scale using technology and production machinery and then transported in bulk nationally and internationally to many retail outlets. Consequently only very small numbers of such sphagnum lined baskets are made up in this way.

15 One company in USA has taken a step forward in this regard and created a sphagnum  
moss lined hanging basket which can much more readily be transported in cartons as  
freight, or even posted in the mail, which makes them much more marketable than the  
previously mentioned type. In these, filaments of loose dry sphagnum moss are fixed onto  
the outside of the basket with very fine filament or wire. This means that no soil or  
20 potting mix is needed to hold the sphagnum moss in place.

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However, the process of sewing the filaments or moss onto the outside of the basket is very time consuming and keeps this type of moss lining within the category of a hand crafted item. As such, this type of liner will always be relatively expensive, limited in numbers, and therefore a speciality item.

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One New Zealand company also markets a compressed sphagnum moss product formed as a blank shaped like a Maltese cross. When placed inside a hanging basket, the edges fold up and contour to the shape of the basket. A disadvantage of a liner in this form is that initially at least, the liner does not conform satisfactorily to the shape of the curved hanging basket.

**Common features of known compact sphagnum liners are:**

- 1 They are both presented to the public in flat, one dimensional form.  
2 Both must be placed inside a hanging basket before they can assume and retain  
the three dimensional shape of the basket.  
3 Both are in untreated compacted sheet form and bear little resemblance to

sphagnum moss.

- 4 Both have to be assembled by the purchaser according to instructions supplied.

5 Extensive market research conducted on our behalf concerning basket liners made up of flat sections of compacted sphagnum moss shows that unless there has been a considerable amount of prior instruction and education, a large proportion of the general public and the gardening public are not aware that:

- such flat shaped pieces of compacted sphagnum moss are in fact basket liners;
- such a smooth surfaced, cardboard-like substance is in fact sphagnum moss.

10

In addition, the public needs instruction as to how such objects should be assembled into their end form as basket liners. In particular, a great deal of care and attention is required to manipulate the blanks to enable them to fit the containers. If the dry compacted sphagnum moss liners are bent to suit the contour of the containers, this leads to cracking. A comparison would be like trying to mould a sheet of balsa wood to fit into a bucket. The cracking results in breaking of the moss fibres themselves. This reduces the fibre length of the moss and the moss in and around the cracks may be of insufficient strength to effectively bind and hold the liner together once filled with soil. This can lead to unattractive holes in the moss with consequent loss of soil through the holes. Accordingly, it is necessary to gently wet the sheets of compressed sphagnum moss before manipulating them into the plant containers. Furthermore, the customer ought to take care with the manner in which the water is applied to the liners. If the temperature of the water is too high ie in excess of 25°C or the pressure too great, the user can easily blow a hole in the liner. Consequently, the degree of care required to manipulate the prior art liners may be viewed as very high, perhaps leading to wastage or excessive difficulty by the end user.

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Consequently, expensive and extensive advertising and promotional material, and special training of shop sales persons at every point of sale has been necessary to combat the fact that many people do not know:

35

- what such objects are and what they are for;
- what they are made of;
- how they are to be assembled.

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35 In spite of all this instruction, which does increase the price unnecessarily, many people still pass them by because they do not know what they are, and do not realise how they make up into a basket liner.

- 5 -

As a result, these liners have been observed in sales outlets being progressively moved into obscure positions of display where they gather dust.

- 5 It is an object of the present invention to provide a plant container liner or a blank therefor, which will address at least some of the foregoing problems or at least provide the public with a useful choice over liners/blanks at present available.

#### Statements of the Invention

- 10 In accordance with a first aspect of the present invention there is provided a liner, blank or sheet comprising one or more sheets of compressed sphagnum moss and having a moisture content such that the liner, blank or sheet is pliable to the extent that it is able to be folded and unfolded with minimal or no degradation to the fibre integrity, wherein the liner, blank or sheet of compressed sphagnum moss is completely enclosed within a moisture retainer comprising a water-resistant package or wrapping to minimise loss of said moisture content from the compressed sphagnum moss of the liner, blank or sheet prior to use of the line, blank or sheet.

- 15 In accordance with a second aspect of the present invention there is provided a method of fabricating a blank for a plant container liner including:  
partially reconstituting one or more sheets of compressed sphagnum moss which is dried or at least substantially dry, until the one or more sheets reaches a moisture content sufficient to enable the one or more sheets to be pliable to the extent that it is able to be folded and unfolded with minimal or no degradation to the fibre integrity; and  
20 completely enclosing the blank of compressed sphagnum moss with a moisture retainer comprising a water-resistant package or wrapping to minimise loss of said moisture content from the compressed sphagnum moss sheet.

- 25 In order to achieve the desired moisture content, the sphagnum moss may be initially dry or substantially dried prior to compaction and then partially reconstituted following its compaction. The moss may be pre-dried to around 18-20% moisture by weight prior to compaction. The partial reconstitution may be achieved by applying a liquid to the compressed sphagnum moss. Preferably the liquid is water. Most preferably the liquid is applied by a fine mist spray. The amount of water applied may be anywhere in the range of 100 g/m<sup>2</sup> up to 1020 g/m<sup>2</sup>. For some forms of the invention, it is preferred that a lesser amount of water is applied, enabling the compressed sphagnum moss when formed into a liner to have walls which retain sufficient stiffness so as to be self-supporting. In this form of the invention, the amount of water added is preferably in the range 113-173 g/m<sup>2</sup>. In a most preferred form of the invention, the amount of water applied is 143 g/m<sup>2</sup>. The water is preferably applied to the side of the blank which forms the exterior of the blank in the fully assembled 3-dimensional form of the liner. This amount of

- 6 -

water is selected so that the liners, blanks or sheets will be pliable but not so saturated as to fall apart or lose the self-supporting quality. Overall, the liners, blanks or sheets will preferably have a moisture content anywhere between 1% and 50% by weight. More preferable the range is 5% to 18% by weight. Another more specific range is 10% to 15%.

5

In other forms of the invention, stiffness of the side walls of the finished liner is not a requisite feature and accordingly, a greater amount of water may be added to the liner, blanks or sheets for a particularly pliable construction. For example, in one form of the invention, the blanks may comprise very large sheets of sphagnum moss intended for large

- 10 plant containers. These blanks may be folded and enclosed in a sealed package. The amount of water added may be in the range of 960-1020 g/m<sup>2</sup>. In a preferred form of this embodiment, 990 g/m<sup>2</sup> is applied to these large liners prior to folding and packaging. Additionally, in order to prevent the layers of sphagnum moss from sticking to each other when folded, a barrier layer may be inserted therebetween. In a most preferred form, plastic sheet have a thickness of 15 microns is inserted between each of the folded layers.

- 20 The moisture retainer may comprise a substantially sealed package which is water impervious. Suitably the liner, blanks or sheets are enclosed in plastic. Where the liners are assembled into their 3-dimensional form then the liners may be individually wrapped in a shrink wrap plastic or nested into one another and shrink wrapped in groups of three or 4. Where the blanks or sheets of sphagnum moss are folded, the package may simply comply a plastic bag. The packaging of the liners in a water impervious package also prevents additional moisture from entering the package and unintentional reconstituting the sphagnum moss.

- 25 However, the invention is not limited to wrapping as a means of minimising moisture loss. It may be possible to spray the liner blanks or sheets with a coating to achieve this end. For example, a waxy coating could be sprayed onto the liner blanks or sheets which is later dissolvable to allow full reconstitution of the liners, blanks or sheets.

- 30 Any of the blanks or liners according to the foregoing aspects may incorporate a layer of water resistant material into the liner or blank.

- 35 It would be desirable for the layer of water resistant material to be sandwiched within the sphagnum moss but towards the outer surface of the liner because for visual impact, concealment of the water resistant layer by a layer of sphagnum moss is desirable. This can be achieved by initially laying a thin layer of the sphagnum moss, then the water resistant layer and finally the major amount of sphagnum moss to be compressed.



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- It is also intended that a wide range of materials may be utilised to form the water resistant or water impervious layer. In a simple form the layer can be provided by a mat of cellulous material such as a suitable grade of paper which may or may not have surface coatings. Suitable surface coatings where provided can facilitate adhesion to the sphagnum moss and increase the water
- 5 retentive characteristics of the layer.



A suitable plastic sheet may replace the sheet of cellulous material with the surface of the sheet being treated to facilitate adhesion to the sphagnum moss if desired. Aluminium foil is another desirable alternative.

- 5 In a yet further modification, the water resistant layer can be provided by treating a section of the sphagnum moss with a suitable chemical mixture so that upon heat and pressure, or pressure alone, a layer of the sphagnum moss sheet will assume characteristics resisting water penetration. For example, a plastics compound which at ambient temperatures would be in liquid form could be sprayed onto the sphagnum moss and which when  
10 subjected to heat and pressure, or pressure alone forms the required water resistant layer.

It is also possible within the ambit of the present invention to provide a liner which has different water retentive characteristics. For example, in the base section and a lower part of the wall there could be a water resistant layer but in the upper section of the wall the  
15 water resistant layer may not be included.

As mentioned above, each blank is generally of a form including a circular base section and a unitary arcuate wall section extending around the circular base. In this way, the wall section defines a continuous wall around the circular base in the assembled form of the  
20 liner. In one form of such a blank the base section may be integrally formed with the wall section along a part of the periphery of the base, allowing the remainder of the wall section to be folded about the remainder of periphery of the base. The blank may be secured in the three dimensional form by overlapping extension areas of the base and/or the wall section and by joining together the ends of the wall section by fastening means  
25 such as staples passing through the overlapped extension areas.

30 In an alternative form of the invention, the blank may be configured to include: a substantially semi-circular base section having a substantially semi-circular edge; and one or more wall sections adapted to fold about the arcuate or semi-circular edge of the base section to form with the base section, a surrounding wall in the 3 dimensional form of the liner wherein at least one of the wall sections is integrally formed with the base section along a part of the semi-circular edge of the base section and is adapted to follow the contour of the semi-circular edge of the base section in the 3 dimensional form of the  
35 liner. It will be appreciated that a liner of this form will be appropriate for use in a wall mounted hanging basket.

As discussed, an appropriately shaped mould may be used to form each of the blanks.

Mould loading devices may be utilised to load a predetermined quantity of moss into the recesses of the moulds.

- Alternatively, the sphagnum moss may be compressed into the form of a larger sheet so that a number of blanks may be cut from the sheet and each blank folded to form a three dimensional liner.

- As already mentioned, the blanks or liners described in the foregoing aspects may be comprised of moss which is preferably pre-dried to around 18 to 20 percent moisture by weight prior to compaction into sheets. In a preferred form of the invention, the moss is compressed without any additional heat being applied. However, in countries (eg Australia) which exclude the import of any moss other than that which is certifiably free of viable seed, the moisture content of the sphagnum moss prior to the compaction may be greater to generate steam during hot-pressing to sterilise the moss. See for example New Zealand Patent Specification 314613/314825, Australian Patent Specification 6037/98 or Chile Patent Specification 1790-98, the contents of which are incorporated herein by reference. However, where possible, the cold-press method is preferred because it is believed that hot-pressing slows the rate at which the compressed sphagnum moss can be reconstituted.

- For transportation it is clearly desirable to ensure that the three dimensional form of the liners are able to be nested one within the other to minimise the transportation space required in sending the liners to the point of sale outlets.

- As mentioned above, packaging is one means of preventing dehydration of the liners. The method may involve: enveloping a single liner or a plurality of nested liners with shrink wrapping material such that the shrink wrapping material extends into the interior of the or the top liner, weighting the shrink wrapping material with a weight placed in the interior of the or the top liner, and heat treating the shrink wrapping material to conform to the shape of the liner.

- The term 'comprising' as used in this specification and claims means 'consisting at least in part of', that is to say when interpreting independent claims including that term, the features prefaced by that term in each claim will need to be present but other features can also be present.

- The invention consists in the foregoing and also envisages construction of which the following give examples only.

#### Brief Description of the Drawings

One preferred form of the invention and modifications thereof will now be described with

reference to the accompanying drawings in which:

Figure 1 illustrates filaments of natural sphagnum moss product as harvested;

Figure 2 illustrates the principle of reconstitution of a sheet of compressed sphagnum moss;

5 Figure 3 is a bottom perspective view of a mould loading device according to a preferred embodiment of the present invention;

Figure 4 is a top perspective view of the mould loading device illustrated in figure 3;

Figure 5 is a bottom perspective view with the mould loading device in operation;

Figure 6 is a perspective view of a negative mould plate;

10 Figure 7 is a cross-sectional detail of the negative mould plate illustrated in figure 6;

Figure 8 is a cross-sectional detail of the mould plate illustrated in figure 6;

Figure 9 is a perspective view of the negative mould plate of figure 6 illustrating the alignment of a cooperable positive mould member;

15 Figure 10 is a perspective/partial cross-sectional view of the positive mould member shown in figure 9;

Figure 11 is a cross-sectional detail of the positive mould member illustrated in figure 10;

Figure 12 is a cross-sectional detail of the positive mould member illustrated in figure 10;

20 Figure 13 is a blank of compressed sphagnum moss which may be used to assemble a plant container liner;

Figure 14 is a top view of the three dimensional form of the liner assembled from the blank in figure 13;

Figure 15 is a side perspective view of the three dimensional liner shown in figure 14;

25 Figure 16 is a perspective view of the three dimensional liner shown in figure 15 with the surface of the exterior of the liner partially reconstituted;

Figure 17 illustrates the liner of figure 16 including a plastic shrink wrapping;

Figure 18 is a perspective view of three liners, nested into a stack and bound by plastic shrink wrapping;

30 Figure 19 is a perspective view of the liner of figure 16 installed in a conventional hanging basket assembly;

Figure 19b is a plan view of a blank for a plant basket;

35 Figure 20 is a blank of compressed sphagnum moss which may be used to assemble a modified plant container liner;

Figure 21 is a top view of the three dimensional liner formed from the blank illustrated in figure 20;

Figure 22 is a front perspective view of the liner in figure 21;

Figure 23 is a view of a wall blank of compressed sphagnum moss and a separate base blank;

Figure 24 shows a top view of the three dimensional liner formed from the component parts as illustrated in figure 23;

5 Figure 25 is a front view of the liner illustrated in figure 24;

Figure 26 is a view of a blank for a compressed sphagnum moss liner according to another preferred embodiment of the invention;

Figure 27 is an inside view of the liner assembled from the blank of Figure 26;

Figure 28 is a front view of the liner of Figure 27;

10 Figure 29 is a further detailed view of the blank shown in Figure 26;

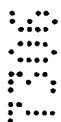
Figure 30 is a view of a further preferred form of a blank, similar to that shown in Figure 26;

Figure 31 is a section through a plant container liner manufactured according to an aspect of the present invention; and

15 Figure 32 is a section through an alternative plant container liner.

#### Preferred Embodiments of the Invention

20 Figure 1 shows filaments of harvested sphagnum moss 100. The sphagnum moss 100 is used primarily in the present invention for its water retentive property which is up to 20 times its own weight in water. The sphagnum moss 100 is also used for its aesthetic value in hanging basket arrangements. The sphagnum moss is harvested from a natural and renewable source.



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Initially, some of the excess water may be removed from the freshly harvested sphagnum moss 100 through the use of a centrifuge or calender rolls. The sphagnum moss 100 is then dried either in a kiln or with natural sunlight. Preferably, the sphagnum moss 100 is dried in a kiln with a continuous conveyor (not shown), the speed of which is controllable. Suitably, an automatic feeding system (not shown) that deposits the moss onto the kiln's continuous conveyor is also provided. The kiln is in the form of a tunnel and operates to circulate heated air which is generated from hot water heat exchangers operating at a temperature as high as 140°C. The moss is gradually dried as it travels through the kiln.



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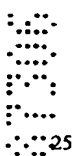


35 After drying, the moss may be left in piles to cool and reabsorb some moisture from the atmosphere. Alternatively, additional moisture may be added to the moss through the use of pressurised water misting nozzles. The optimum moisture content of the moss prior to

pressing is 18 to 20 percent by weight although a range of 3 to 17 percent by weight is commonly used. It is considered that anything in the range of 2 to 20 percent by weight will work.

5 When an appropriate moisture content has been reached, the sphagnum moss can be compressed into sheets 102 as illustrated in figure 2. The sphagnum moss sheet 102 has the ability to absorb a significant quantity of water 104 and reconstitute into its substantially original state. The sheet 102 illustrated in figure 2 is included to provide the reader with an appreciation of the ability of sphagnum moss to reconstitute from a compressed, substantially dried state to its substantially original state. Prior to reconstitution, the sheet 102 may be cut into one or more blanks, each of which may then be assembled to form a three dimensional liner. However, in the most preferred form of the invention to be explained by the following text, the sphagnum moss is compressed directly into the form of individual blanks each of which, when assembled forms a three dimensional liner of the form illustrated in Figure 15. Figure 9 illustrates the general form of the mould used to form each of the blanks of Figure 15. The mould includes a negative mould plate 600 having a number of mould recesses 602 and positive mould members of a shape complimentary to that of the recesses. Accordingly, a mould loading device 300 (Figure 3) is used to load sphagnum moss into the mould recesses 602.

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The mould loading device 300 comprises a filling box 302 generally conforming to the shape of the mould recess 602 to be filled. The filling box 302 shown in figure 3 includes a base 304 and side walls 306 but is open at the top as illustrated in figure 4. The base 304 includes finger slots, the reason for which will be explained.

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The mould loading device 300 further includes a handle portion 308 conforming only approximately to the shape of the filling box 302. Dependent from the handle portion 308 are four dowels 310 (only three of which are shown). These dowels 310 are fixed to the handle portion 308 at spaced locations but extend slidably through apertures provided in the base 304 of the filling box 302. As can be seen in figure 5, the dowels 310 are attached to a false bottom 316 which is complimentary in shape to the base of the filling box. The false bottom 316 is slidable within the filling box 302 and is controlled by the handle portion. In figure 3, the handle portion has been pulled out as far as possible so that the false bottom 316 engages against the inside of base 304. In this configuration, the spring loaded latch 318 has a pin which extends into an aperture provided in centre dowel 310. This holds the false bottom 316 in position against the inside of base 304 during filling and tipping.

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In use, the moss loading device is oriented in figure 4 with the handle portion 308 fully extended and the latch in position in the dowel 310. Sphagnum moss 100 is inserted into the open end of the filling box 302. Once filled, the mould loading device is weighed on electronic scales to ensure that an appropriate quantity of moss has been inserted into the filling box. An appropriate amount might be approximately 869 g/m<sup>2</sup> of area of the finished blank. Once filled to a satisfactory level, the mould loading device 300 is brought to the negative mould plate 600 (figure 6, figure 9) and the loading device is deftly flipped over so that the opening is in register with the mould recesses 602 of the mould plate 600. To ensure adequate removal of the contents of the mould loading device 300, the latch 318 is released to allow the user to push handle portion 308 towards the base 304. The handle portion 308 is configured to enable the user to use both hands to extend around respective parts of the handle portion 308 with the users fingers inserted through the finger slots 305. Squeezing together of the portion of the base between the finger slots 305 and the handle portion 308 ensures full ejection of the sphagnum moss 100 from the filling box 302 into the mould cavity 602. Depending on the size of the filling box 302 and the predetermined correct weight of the moss in the filling box, the thickness of the moss deposited into each mould recess will be approximately 60 to 85 mm.

20 The negative mould plate 600 illustrated in figure 6 has a regular array of mould recesses 602 shaped so that the blanks produced thereby will conform to those illustrated in figure 13, to enable the assembly of the three dimensional liner illustrated in figure 15, with little if any wastage of sphagnum moss material.



25 The negative mould plate 600 is primarily constructed of a high density PVC foam material 700 sold under the trade mark KLEGECELL. The high density foam material 700 is sandwiched between two sheets of plywood 702, 704. The sheet 702 forms the upper surface of the mould and the sheet 704 defines the lower periphery of the high density foam material 700. A further sheet of plywood 706 is disposed to define the base of the negative mould plate 600.



30 The high density PVC foam material 700 is of the type commonly used in the construction of surfboards, sailboards and in general boat and yacht construction. Suitably the high density foam material should be both light and strong. The choice of plywood for the sheet 702, 704, 706 has been made because plywood is able to withstand the high pressures applied to it during the pressing process (500 - 3500 psi) (3.448 - 24.133 MPa).



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5 All of the layers in the negative mould sheet 600, apart from the base layer 706 are cut to remove portions in the shape of the blanks to be formed by the mould recesses 602. Each of the layers 700, 702, 704 is provided with the cut outs in register with each other so that when the layers are stacked one on top of each other, the layers will define the mould recesses 602. Only the base layer of plywood 706 remains in tact and thereby defines the base of the mould recesses 602. The depth of the mould recesses can range between 35 and 90 mm depending on the application. The layers are glued together to form a laminate. The surface of the foam layer 700 defining the working surface of the mould recess 706 is provided with a fibreglass coating 800 to protect the working surface of the  
10 foam layer 700 from abrasion during pressing. The fibreglass coating 800 may include polyester, vinyl ester or epoxy resins and chop strand matt as is known to those skilled in the art of fibreglass.

15 The positive mould members 900 illustrated in figures 9 to 12 are comprised of four sheets of plywood including a top sheet 910 of 7 mm plywood, a base sheet 920 of 12 mm plywood and two inner sheets 930, 940 of 12 mm plywood. The inner sheets of plywood 930, 940 are machined with a plurality of fairly evenly spaced apertures 950 which serves to reduce the weight of the positive mould member 900. The layers of plywood 910, 920, 930, 940 are glued together to form a laminate.

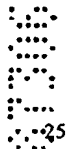
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30 The shape of each positive mould member 900 (excluding positive mould member 901 illustrated in Figure 16a) is complimentary to the shape of each mould recess 602, except that the positive mould member 900 is smaller than the mould recess 602 so that a gap of between 2 and 3 mm is provided between the sides of the positive mould member 900 and the side wall of the mould recess 602 when the positive mould member 900 is inserted into the mould recess 602. Additionally, the positive mould members 900 are formed so as to be 5 to 10 mm thicker than the depth of the mould recesses 602. In this way, when the full pressure of the press bears on the positive moulds, no pressure will be exerted onto the top surface of the negative moulds. In view of the foam material, pressure on the negative mould plate 600 might cause it to be crushed.

35 In use, the mould recesses 602 of the negative mould plate 600 are filled in turn with sphagnum moss using the mould loading device 300. When all of the mould recesses 602 have been loaded with sphagnum moss, each of the positive moulds 900 is inserted into a respective mould recess 602. The assembly of the negative mould plates 600 and the positive mould members 900 is thus ready for insertion between the platens of a platen press (not shown). The press may be of a conventional type with the assembly of the



mould plate 600 and mould members 900 being carried or conveyed to the press and inserted between the platens thereof, prior to the platens being brought together to compress the sphagnum moss within each of the mould recesses 602. The pressure for pressing the moss range is between 500 psi and 3800 psi (3.448 - 26.201 MPa) for a time ranging between 10 seconds and 3 minutes. The combination of pressure and time is such that the thickness of the blanks produced is between 2.5 and 4 mm and yet still able to reconstitute with the addition of water. This degree of compression provides the blank with sufficient rigidity to enable the walls of the assembled three dimensional liner to be self supporting. It is considered that a compressed thickness of between 1mm and 6mm for the stated pre-compression thickness of moss should also provide sufficient rigidity for the walls to be self-supporting.

In an alternative type press (not shown) the lower platen may be provided in the form of a table slidable into and out of the press. In this embodiment, the positive mould members are affixed to the upper platen of the press and the negative mould plate is affixed to the lower platen of the press. When the lower platen is moved into position inside the press, the mould recesses and the positive mould members are in precise alignment. With this arrangement, the negative mould plate 600 may be conveniently accessed for loading and unloading by sliding the table out of the press. In another alternative form of the press, the upper platen may be tiltable to provide increased access to the negative mould plate 600.



As illustrated in figure 13, the blank 1 which will be formed using the mould assembly of negative mould plate 600 and positive mould plate 900 has an arcuate wall section 2 and a circular base integrally formed with the wall section. An extension 4 at one end of the wall section 2 provides for an overlap to occur between the joining wall sections when folded about the base 3. Connecting staples 9 pass through the overlapped sections to retain the wall section of the liner assembled in the three dimensional form as illustrated in figure 14.

The extension 5 beyond the perimeter of the base 3 indicated in dotted outline in figure 13 and the tab 7 can be folded up during assembly to overlap the lower periphery of the wall 2 and an attaching staple 10 passing through the tab 7 and wall of the blank will complete the assembly of the three dimensional liner 11 illustrated in figures 14 and 15.

Other forms of fastening are also considered within the scope of the present invention. The compressed sphagnum moss liner 11 has the appearance of cardboard and consequently is not easily recognisable to the purchasing public as a sphagnum moss liner.

To bring the surface of the sphagnum moss liners to resemble their original natural state, a fine mist of water is sprayed onto the exterior side of the blank only, prior to assembly using an atomised fluid spray to produce a fine mist. The amount of water is about 113-173 g/m<sup>2</sup>, preferably 143 g/m<sup>2</sup>. The temperature of the water is also controlled within a range of 15-25°C. This serves to at least partially reconstitute the surface layer of the blank 1 on one side. The blank 1 is then assembled into the three dimensional form of the liner 11 optionally through the use of the connecting staples 9 in the manner illustrated in figures 14 and 15. The assembled liner will resemble that illustrated in figure 16 with the surface layer 11a of the exterior of the blank 11 reconstituted as illustrated. The degree of reconstitution (143 g/m<sup>2</sup> of water) enables the liner to be pliable to the extent that it is able to be folded and unfolded with minimal or no degradation of the fibre integrity and yet enables the walls of the liners to be sufficiently stiff as to be self-supporting. To prevent drying out, the liners are enclosed in a sealed package as discussed in connection with Figure 17. If the liners were to dry out they would become brittle and thus susceptible to damage and fragmentation which would render them inoperable.

Following stapling, the liners 11 have appropriate product information and advertising sheets placed in or over the liners 11 in such a manner that they contour to the curved surfaces of the liners 11.

Figure 17 illustrates the liner 11 enclosed within a bag 11b of water-impervious shrink wrap plastic of 19 micros in thickness. The bag is sealed in a circular shape around the top of the liner 11, 10 to 100 mm from the top edge with a purpose built circular sealing machine. This provides a surplus of plastic which fits down inside the liner 11 against the sides and the bottom. The plastic is held in position against the sides and bottom of the liner 11 by a purpose built frame fitting the outside and the inside of the liner which clamped together holds the plastic in place. The wire frame conforms to the inner contour of the liner 11. As the wire frame (not shown) is inserted into the liner 11, the plastic is held against the sides and bottom of the liner. Holes punched into the plastic prior to sealing enable air trapped inside the bag to escape when the wire frame is inserted into the liner. The liner 11 with the sealed bag and the purpose built frame is passed through a shrink oven akin to a conveyor bread oven. The liner 11 and accompanying wrap is then allowed to cool, after which the purpose built frame is removed. The result is that the plastic still lies snug against the interior and the bottom of the liner and not stretched tightly across the top of the liner 11 as would occur in conventional shrink wrapping.

The use of a circular bag with a circular sealer eliminates bunching of the plastic on the

outside of the liner which would occur with the use of a square bag. Additionally, with three liners nested together and shrink wrapped as a pack of three, the shrink wrapping process has the additional benefit of compacting the liners more tightly together than prior to wrapping. This enables more three-packs to fit into a cardboard carton than a single shrink wrapped package.

The intended use of the liner is illustrated in figure 19. As shown, the liner 11 is inserted into a conventional hanging basket assembly 11d. Once the liner 11 is inserted into the basket, it may be fully reconstituted by having water poured over or by being soaked in water for a matter of minutes, to enable full reconstitution to occur.

It will be appreciated that depending upon the shape of the blank, various liner shapes can be created. Generally, it is desirable that the shape is one which can allow nesting of similar shaped liners. Such nesting configurations are employed where the assembly step is performed at a site remote from the point of sale.

Figure 19b illustrates the form of a compressed sphagnum moss blank for a plant container of a specific form. The blank is particularly large and so it must be folded up to be transported from the place of manufacture to the point of sale. The blank is formed accordingly to the processes set out above. Once formed, one side of the blank is partially reconstituted with water in the amount of  $990 \text{ g/m}^2$ . This is merely a preferred amount and an acceptable range lies between  $960\text{-}1020 \text{ g/m}^2$ . Once the compressed sphagnum moss blank has been sprayed with water having a temperature in the range of  $15\text{-}25^\circ\text{C}$  by an atomised fluid spray, the blank may be folded up. Suitably, plastic sheeting of 15 microns in thickness is inserted between the layers of the folded blank to prevent the layers from sticking to each other. The folded blanks are then inserted into plastic bags of 60 microns in thickness. A partial reconstitution of the large sphagnum moss liners provides them with sufficient pliability to fold into a plastic bag and then to be unfolded to fit into a plant basket after sale without any further spraying.

An illustration of another possible modified blank and liner formed therefrom is illustrated in figures 20 to 22 of the accompanying drawings. In figure 20 the blank 12 of compressed sphagnum moss is provided with a side wall section 13 and an integral base section 14. The shape is designed to create a three dimensional liner which, when assembled is, suitable for a plant container supported against a surface such as a wall. The overlap section 15 allows the joining ends of the wall section to be connected and the extension section 16 with tab 17 is upturned to join by way of staples 18, 19, the base in

a manner similar to that previously described in connection with figures 13 to 15. Optionally, the exterior of the liner 20 is then sprayed with water.

5 A further modification of the present invention allowing a liner to be assembled from a base and wall section is illustrated in figures 23 to 25 of the drawings. A wall blank 21 of compressed sphagnum moss is provided together with a separate base member 22 having a lip 23. An overlap section 24 allows for the joining ends of the wall using staples 25. The lip 23 is upturned and then connected to the lower end of the wall with staples 26 thereby completing the three dimensional liner 27 as illustrated in figures 24 and 25.  
10 The wall section 21 is shown with a scalloped upper periphery that is also produced as a scalloped finish in the assembled liner 27. Optionally, the exterior of the liner is then sprayed with water to partially reconstitute the outer surface layer.

15 It will be appreciated from the above description of the method of manufacture that from an outward appearance it is not easy to distinguish between a liner that has been formed to incorporate a water retentive barrier within the compressed sphagnum moss and one which does not have such a barrier. Establishing a distinctive peripheral edge such as the scalloped edge 28 could be used to provide a visual distinction indicating to a user that the liner has a water retentive barrier.  
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According to another embodiment of the invention, the blank 30 illustrated in Figure 26 is assembled to form a liner 32 for inserting into a wall mounted hanging basket or container (not shown) of the kind which has a planar semi-circular back section for mounting against a supporting wall surface and a curved front wall section, generally conforming to the surface of a quarter sphere. Such baskets or containers have an open top for insertion of the plant.  
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The blank 30 is of integral construction, having a back section 34, a first front section 36 and a second front section 38. The back section 34 is substantially semi-circular in shape and is connected to the second front section at a central portion of its curved periphery. On the remainder of its curved periphery on either side of the central connected portion, the back section 34 is provided with overlap sections 40,42. These overlap sections are folded at approximately right angles to the back section 34 to overlap with the rear edges 43,44 of the second front section 38. Optionally, these overlap sections 40,42 could be clipped to assist with joining to the rear edges 43,44 of the second front section 38.  
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The first and second front sections 36, 38 are shaped so that when assembled together they

will approximately conform to the shape of the surface of a quarter sphere. The two divisions between the first and second front sections 36,38 are thus in the manner of darts commonly employed in the construction of garments. At each of the two divisions between the first and second front section 36,38 are overlap sections 46,48. These overlap sections 46, 48 overlap respective adjacent edges of the first front section 36 in the assembled configuration of the liner 32. The overlap sections 46,48 could be clipped to assist the assembly process.

Figure 29 illustrates a further detailed view of the blank of Figure 26 . If the rear edges 43,44 of the second front section 38 were to be curved around to follow the corresponding periphery of the back section 34, as indicated by the phantom lines, then point 50 on the second front section 38 would correspond to point 52 on the back section 34. Instead, the shape of the blank is such that the second front section 38 is extended as shown in Figure 29 so that point 54 meets with point 52 on the back section. The rear edges 43,44 of the second front section 38 must therefore be gathered or drawn inwards and/or the overlap sections 40,42 stretched to achieve the specified fit. This is required to achieved the desired spherical fullness to the assembled liner. The overlap sections 40,42 are stapled near to the rear edges of the second front section 38.

Similarly, point 58 on the first front section 36 would normally meet with point 57 on the second front section 38. Instead, point 58 meets with point 59. The forward edges of the second front section 38 must therefore be gathered and/or the adjacent edges of the first front section 36 stretched to achieve the required fit and accordingly obtain the desired fullness for the assembled liner 32. The joins are secured by staples.

On assembly, the overlap portions 46,48 of the first front section 36 are joined to the second front section followed by the joining of the back section 34 to the second front section 38. Staples are used to secure the joins and hold the liner in the assembled configuration.

It will be appreciated that the blank illustrated in Figures 26 and 29 need not be of integral construction and could be constructed of two or more parts. For example, the back section 34 could be formed as a discrete component of the liner with appropriate joining tabs provided on either the back section or the second front section. Additionally, the first and second front sections 36,36 could also be discrete.

Once the liner, in whatever form, has been assembled into a three dimensional form, the

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could be easily handled when covering larger surface areas.

One such application of the invention would be to provide an undersurface for a lawn in arid or semi-arid conditions with the water resistant or substantially impervious layer provided in the sheet. The sheet according to the present invention will retain moisture allowing an even watering of an area, for example, of lawn with the application of a subterranean watering system using the drip feed technique. The result achieved in the present invention provides an evenness of moisture over the area of lawn and this can be contrasted with an area of lawn on an untreated bed of sphagnum moss where the moisture pattern throughout the watered area is uneven. This is because the barrier in the sheet according to the present invention operates to restrict movement of water allowing the moss to become saturated. It is recognised that sphagnum moss presents a desirable environment for root growth.

Hot and cold pressing creates different reconstitution characteristics in a compressed sphagnum moss sheet. Hot pressing establishes a longer reconstitution time whereas with cold pressing reconstitution occurs much more rapidly. When the liner 11 as illustrated in figure 16 is folded into the basket and the moss reconstitutes, the expansion caused by reconstitution and the forces generated through that expansion tend to compress the joints thereby restricting the amount of moisture which will be lost through these joints. While the openings allow for appropriate drainage to avoid stagnation problems they do restrict the amount of moisture which is able to penetrate to the outer surface of the compressed sphagnum moss sheet. This means that the visual appearance of the liner is retained and does not visually deteriorate as with conventional sphagnum moss liners. In conventional liners, moisture in the outer surface of the moss causes a green algae growth giving a visually less pleasant appearance.

One of the greatest causes for moisture loss from the hanging basket is the evaporation surface created by the outer surface of a conventional liner. This evaporation is accentuated in any conditions where there is a draft or movement of air but with the present invention because of the water resistant barrier, such evaporation is minimised thereby retaining moisture within the hanging basket.

With the significant reduction of water loss it is not necessary for the hanging baskets to be watered as regularly to retain optimum growing conditions. With conventional basket liners and untreated sphagnum moss liners it is frequently necessary to water the plants at least daily and sometimes more than once a day depending upon ambient conditions to

preserve a healthy environment for the plant. With the present invention the watering programme can be modified and while conditions will determine the required maintenance, much greater gaps between watering are possible.

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**WHAT WE CLAIMED IS:**

1. A liner for a plant container, the liner comprising one or more sheets of compressed sphagnum moss and having a moisture content such that the liner is pliable to the extent that it is able to be folded and unfolded with minimal or no degradation to the fibre integrity, wherein the liner is completely enclosed within a moisture retainer comprising a water-resistant package or wrapping to minimise loss of said moisture content from the compressed sphagnum moss of the liner prior to the use of the liner.
2. The liner as claimed in claim 1 formed from sphagnum moss which is compressed and dry or substantially dried and then partially reconstituted to the desired moisture content.
3. The liner as claimed in claim 2 wherein the partial reconstitution is achieved by applying a liquid to the compressed sphagnum moss.
4. The liner as claimed in claim 3 wherein the liquid comprises substantially water.
5. The liner as claimed in claim 3 or 4 wherein the liquid is applied by a fine mist spray.
6. The liner as claimed in any one of claims 3 to 5 wherein the liquid is applied to the exterior of the liner.
7. The liner as claimed in claim 6 wherein the amount of liquid applied is in the range of 100 to 1020 g/m<sup>2</sup> of the surface area of the exterior of the liner.
8. The liner as claimed in claim 7 wherein the amount of liquid added is in the range 113-173 g/m<sup>2</sup> of the surface area of the exterior of the liner.
9. The liner as claimed in claim 8 wherein the amount of liquid applied is about 143 g/m<sup>2</sup> of the surface area of the exterior of the liner.
10. The liner as claimed in claim 7 wherein the packaging is shrink-wrapping.
11. A blank configured to form a liner for a plant container, the blank comprised of one or more sheets of compressed sphagnum moss having a moisture content such that the blank is pliable to the extent that it is able to be folded and unfolded with minimal or no degradation to the fibre integrity, wherein the blank of compressed sphagnum moss is

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completely enclosed within a moisture retainer comprising a water-resistant package or wrapping to minimise loss of said moisture content from the compressed sphagnum moss of the liner.

5 12. The blank as claimed in claim 11 formed from sphagnum moss which is compressed and dry or substantially dried and then partially reconstituted to the desired moisture content

10 13. The blank as claimed in claim 12 wherein the partial reconstitution is achieved by applying a liquid to the compressed sphagnum moss.

14. The blank as claimed in claim 13 wherein the liquid comprises substantially water.

15 15. The blank as claimed in claim 13 or 14 wherein the liquid is applied by a fine mist spray.

16. The blank as claimed in any one of claims 13 to 15 wherein the liquid is applied to a first side of the blank.

20 17. The blank as claimed in claim 16 wherein the amount of liquid applied is in the range of 100 to 1020 g/m<sup>2</sup> of the surface area of said first side of the blank.

25 18. The blank as claimed in claim 17 wherein the amount of liquid added is in the range 113-173 g/m<sup>2</sup> of the surface area of said first side of the blank.

19. The blank as claimed in claim 18 wherein the amount of liquid applied is about 143 g/m<sup>2</sup> of the surface area of said first side of the blank.

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20. The blank as claimed in claim 14 wherein the packaging is shrink-wrapping.

35 21. The blank as claimed in any one of any one of claims 13 to 15 wherein the amount of liquid applied is in the range of 960-1020 g/m<sup>2</sup> of the flat area of the blank.

22. The blank as claimed in claim 21 wherein the amount of liquid applied is about

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990 g/m<sup>2</sup> of the surface area of the first side of the blank.

23. The blank as claimed in claim 21, in folded configuration and enclosed in a package.

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24. The blank as claimed in claim 23 including a barrier layer inserted between the layers of the folded blank to minimise sticking therebetween.

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25. A sheet of compressed sphagnum moss having a moisture content such that the sheet is pliable to the extent that it is able to be folded and unfolded with minimal or no degradation to the fibre integrity, wherein the sheet of compressed sphagnum moss is completely enclosed within a moisture retainer comprising a water-resistant package or wrapping to minimise loss of said moisture content from the compressed sphagnum moss.

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26. The sheet as claimed in claim 25 formed from sphagnum moss which is compressed and dry or substantially dried and then partially reconstituted to the desired moisture content.

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27. The sheet as claimed in claim 26 wherein the partial reconstitution is achieved by applying a liquid to the compressed sphagnum moss.

28. The sheet as claimed in claim 27 wherein the liquid comprises substantially water.

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29. The sheet as claimed in claim 27 or 28 wherein the liquid is applied by a fine mist spray.

30. The sheet as claimed in any one of claims 27 to 29 wherein the liquid is applied to a first side of the sheet.

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31. The sheet as claimed in any one of claims 27 to 29 wherein the amount of liquid applied is in the range of 100 to 1020 g/m<sup>2</sup> of the surface area of said first side of the sheet.

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32. The sheet as claimed in claim 31 wherein the amount of liquid added is in the range 113-173 g/m<sup>2</sup> of the surface area of said first side of the sheet.

33. The sheet as claimed in claim 32 wherein the amount of liquid applied is about

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143 g/m<sup>2</sup> of the surface area of said first side of the sheet.

34. The sheet as claimed in claim 25 wherein the packaging is shrink-wrapping.

5 35. The sheet as claimed in claim 31 wherein the amount of liquid applied is in the range of 960-1020 g/m<sup>2</sup> of the surface area of a first side of the sheet.

36. The sheet as claimed in claim 35 wherein the amount of liquid applied is about 990 g/m<sup>2</sup> of the surface area of a first side of the sheet.

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37. The sheet as claimed in claim 35, in folded configuration and enclosed in a package.

15 38. The sheet as claimed in claim 37 including a barrier layer inserted between the layers of the folded sheet to minimise sticking therebetween.

39. A method of fabricating a blank for a plant container liner including:  
partially reconstituting one or more sheets of compressed sphagnum moss which is dried  
or at least substantially dry, until the one or more sheets reaches a moisture content  
sufficient to enable the one or more sheets to be pliable to the extent that it is able to be  
folded and unfolded with minimal or no degradation to the fibre integrity; and  
completely enclosing the blank of compressed sphagnum moss with a moisture retainer  
comprising a water-resistant package or wrapping to minimise loss of said moisture  
content from the compressed sphagnum moss sheet.

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40. The method as claimed in claim 39 wherein the partial reconstitution is achieved  
by applying liquid to the compressed sphagnum moss.

30 41. The method as claimed in claim 40 wherein the liquid comprises substantially water.

42. The method as claimed in claim 41 wherein the liquid is applied by a fine mist  
spray.

35 43. The method as claimed in any one of claims 41 or 42 wherein the liquid is applied  
to a first side of the blank.

44. The method as claimed any one of claims 40 to 43 wherein the amount of liquid

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applied is in the range of 100 g/m<sup>2</sup> to 1020 g/m<sup>2</sup> of the surface area of the first side of the blank

45. The method as claimed in claim 44 wherein the amount of liquid added is in the range 113-173 g/m<sup>2</sup> of the surface area of the first side of the blank.

46. The method as claimed in claim 45 wherein the amount of liquid applied is about 143 g/m<sup>2</sup> of the surface area of the first side of the blank.

47. The method as claimed in claim 39 wherein the water-resistant package or wrapping is plastic.

48. The method as claimed in any one of claims 40 to 43 wherein the amount of liquid applied is in the range of 960-1020 g/m<sup>2</sup> of the surface area of a first side of the blank.

49. The method as claimed in claim 48 wherein the amount of liquid applied is about 990 g/m<sup>2</sup> of the surface area of a first side of the blank.

50. The method as claimed in claim 48, wherein the moisture retainer comprises a package, and the method includes folding the blank and enclosing it in the package.

51. The method as claimed in claim 50, including a barrier layer inserted between the folds of the blank.

52. The liner as claimed in claim 1, wherein the liner is sealed within the moisture retainer to substantially prevent loss of the moisture content.

53. The liner is claimed in claim 52, where the moisture retainer comprises a plastic bag within which the liner is completely enclosed and sealed.

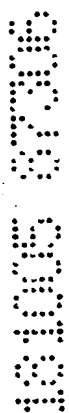
54. A liner for a plant container as claimed in claim 1 substantially as hereinbefore described with reference to the accompanying figures.

55. A blank configured to form a liner for a plant container as claimed in claim 11 substantially as hereinbefore described with reference to the accompanying figures.

56. A sheet of compressed sphagnum moss as claimed in claim 25 substantially as hereinbefore described with reference to the accompanying figures.

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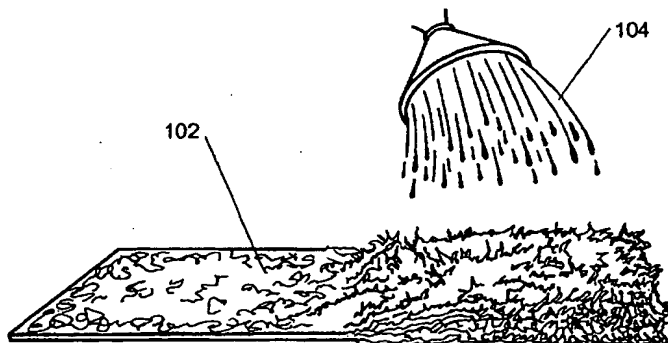
57. A method of fabricating a blank for a plant container as claimed in claim 39 substantially as hereinbefore described with reference to the accompanying figures.

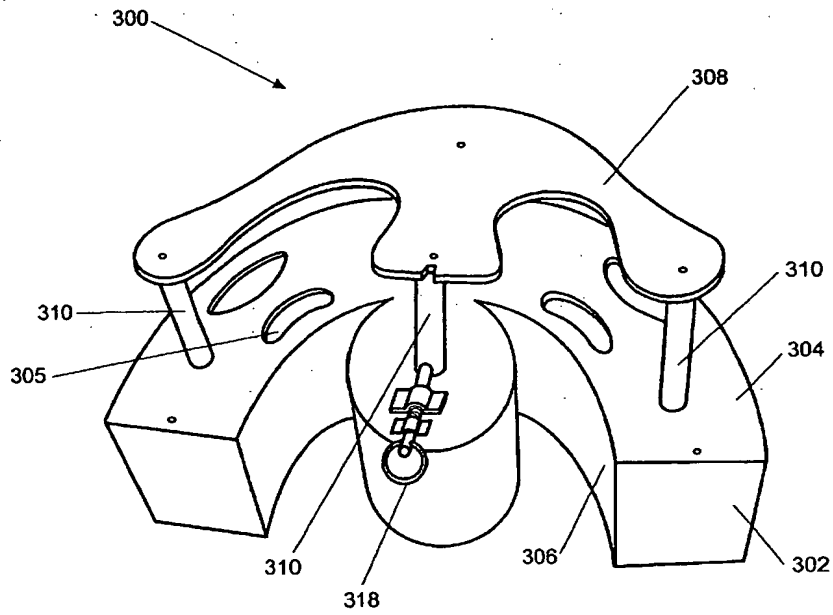


TOTAL P.30



**FIG. 1**

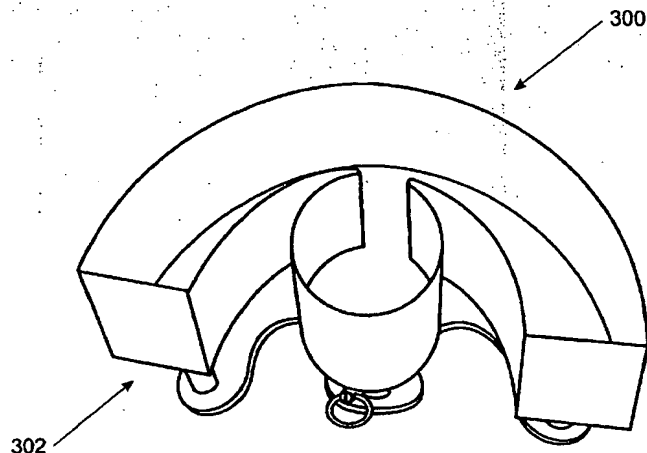




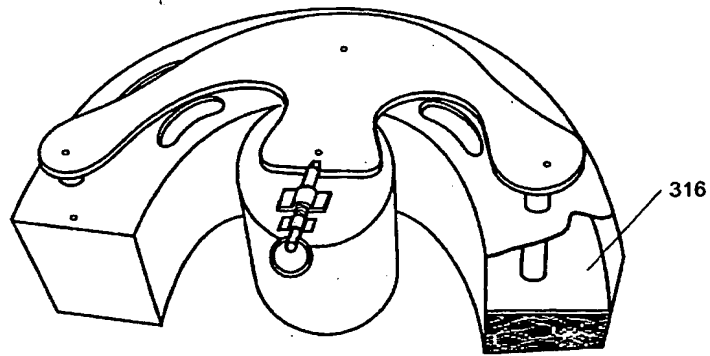
**FIG. 3**



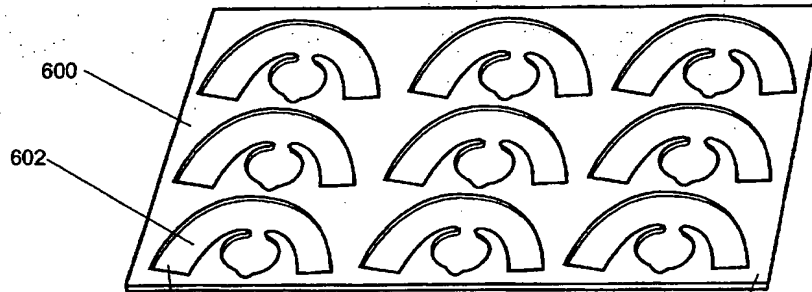
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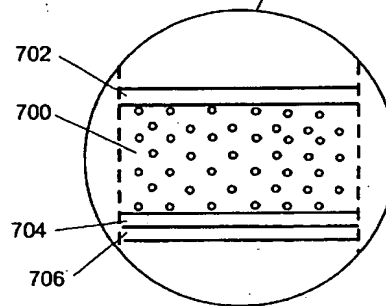
**FIG. 4**



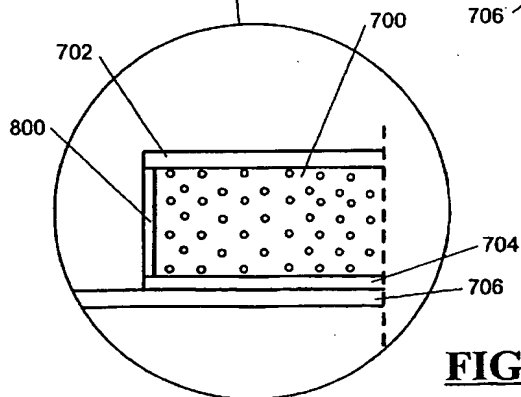
**FIG. 5**



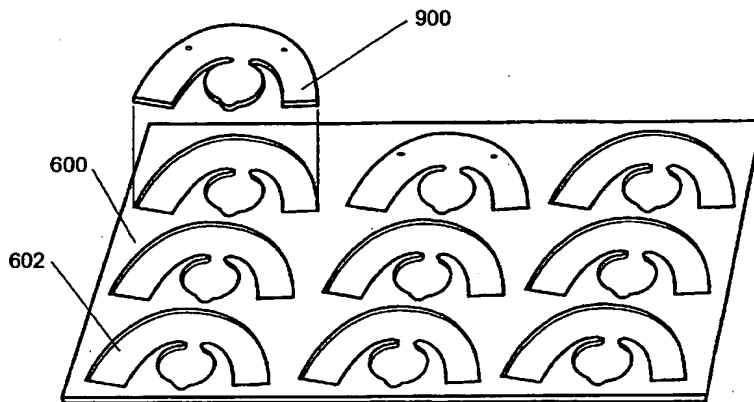
**FIG. 6**



**FIG. 7**



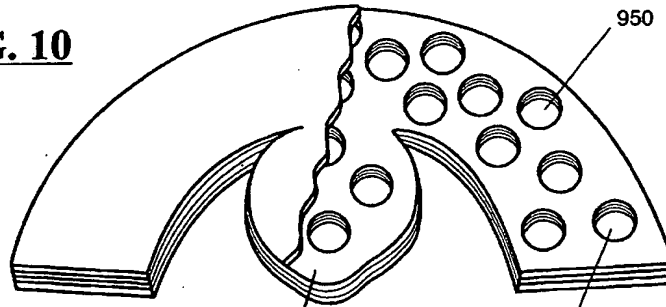
**FIG. 8**



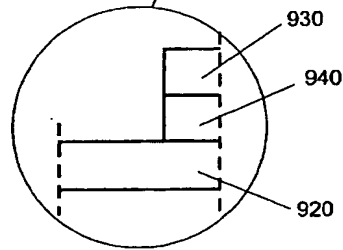
**FIG. 9**

FIG. 9

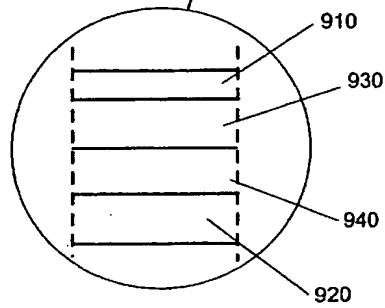
**FIG. 10**

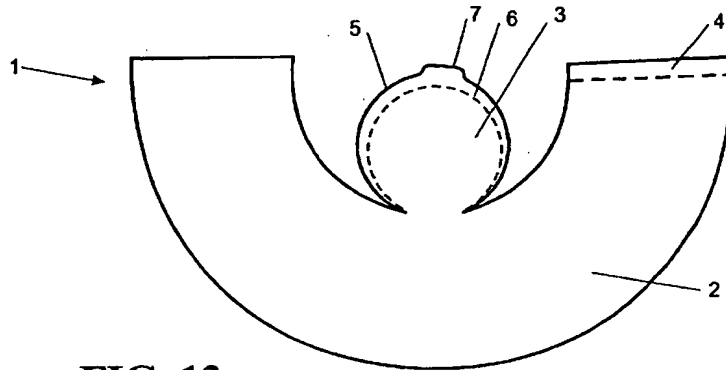


**FIG. 11**

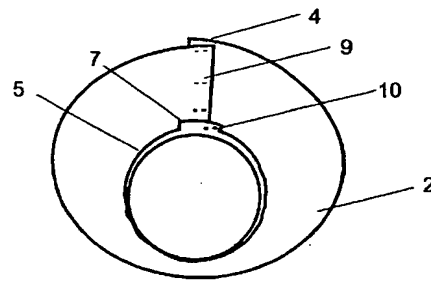


**FIG. 12**

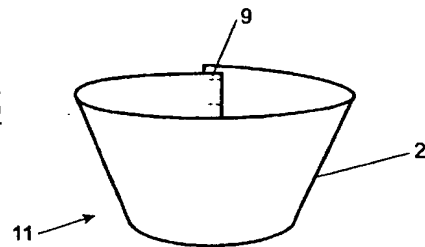




**FIG. 13**

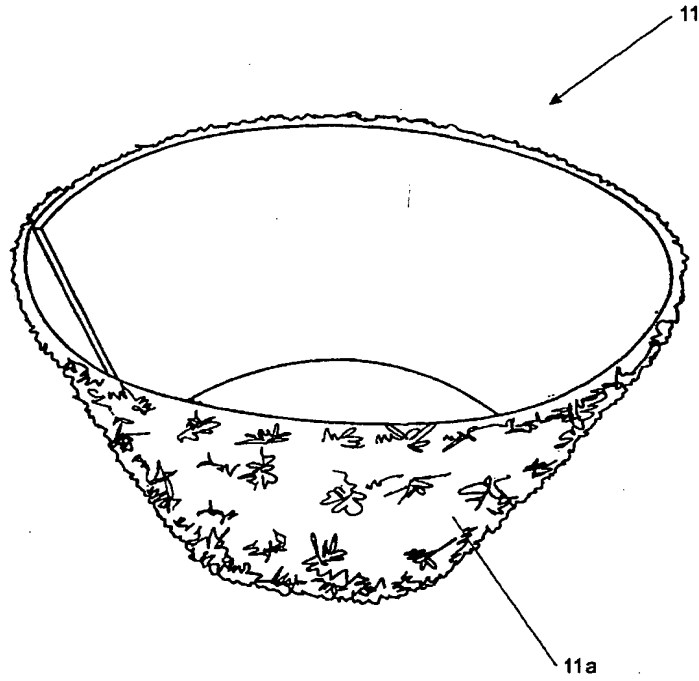


**FIG. 14**



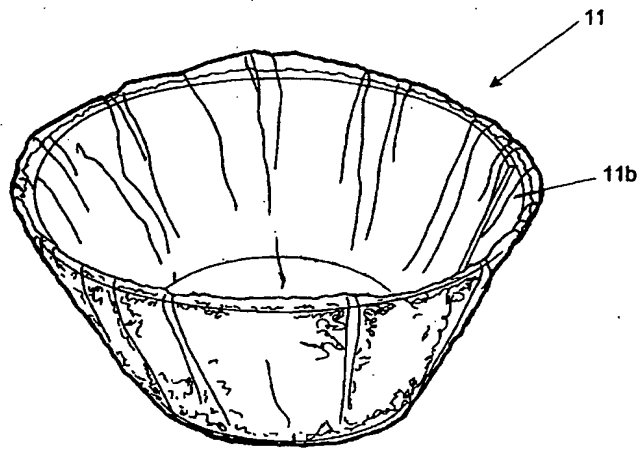
**FIG. 15**

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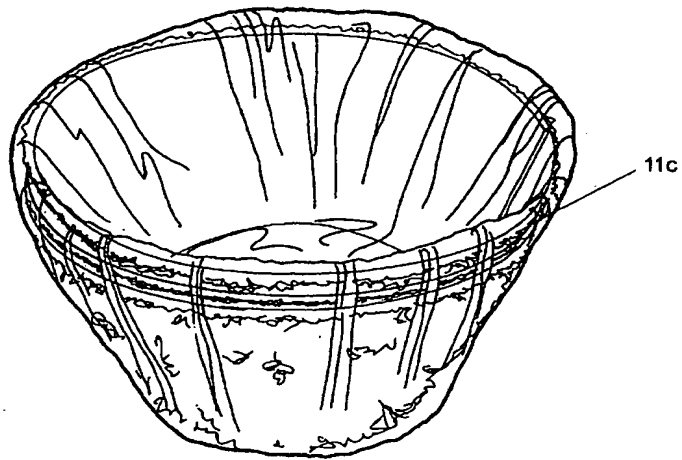


**FIG. 16**

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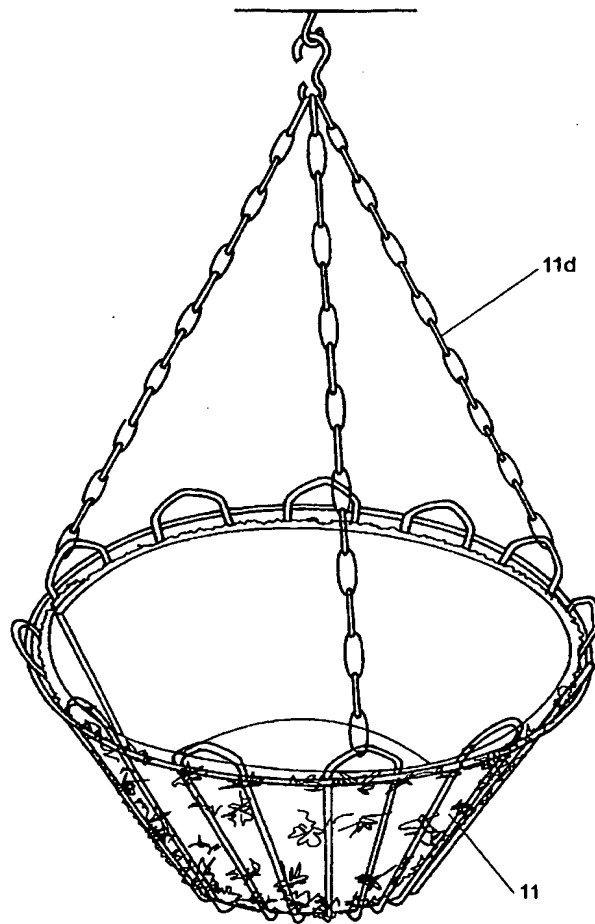
**FIG. 17**



**FIG. 18**

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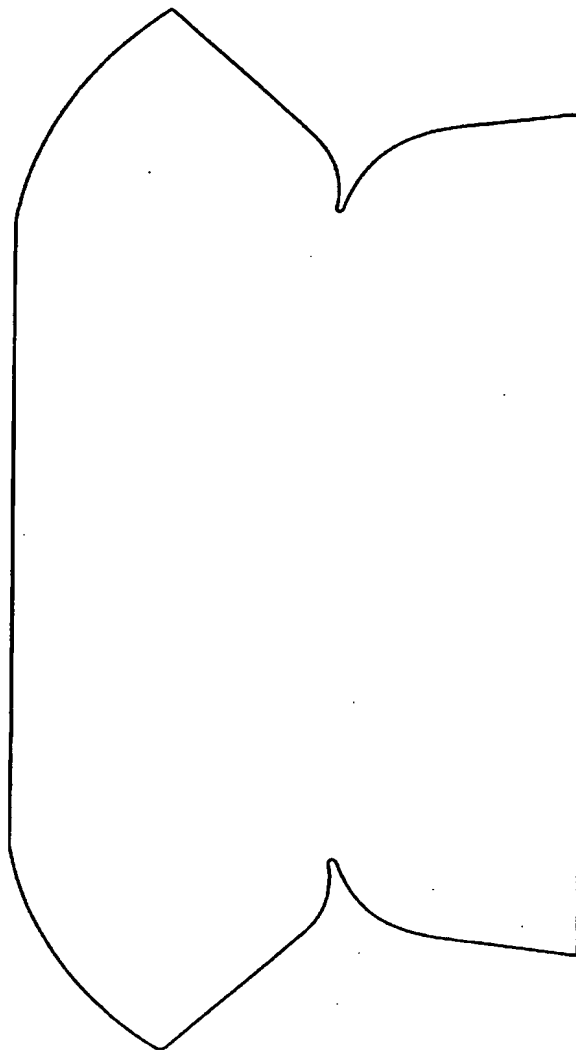
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**FIG. 19**



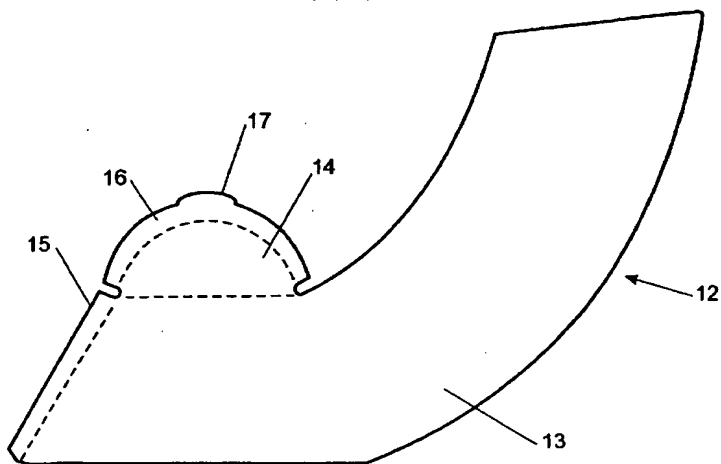
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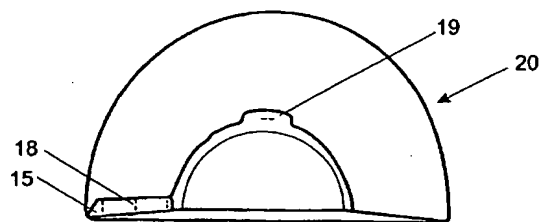
**FIG. 19b**

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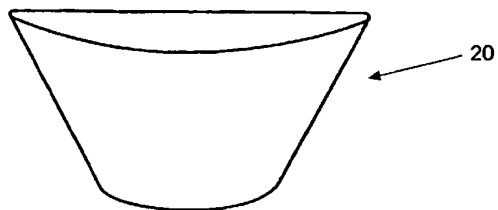
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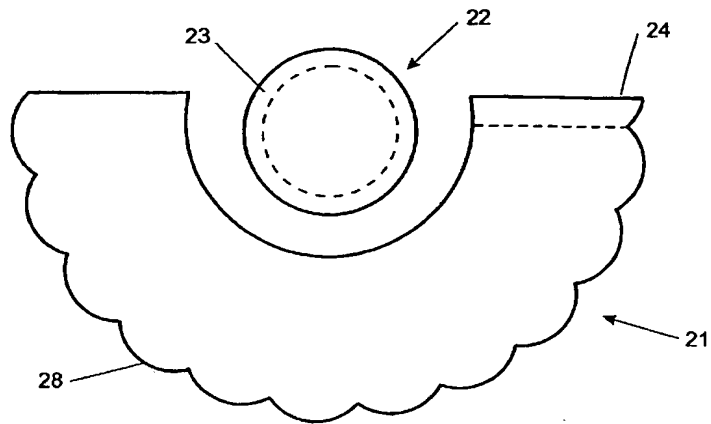
**FIG. 20**



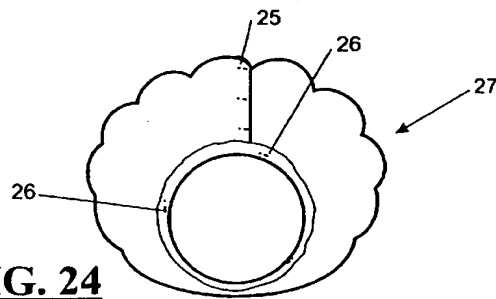
**FIG. 21**



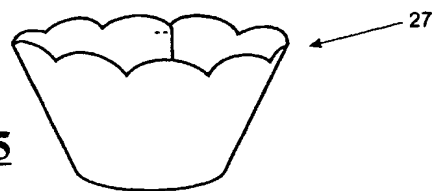
**FIG. 22**



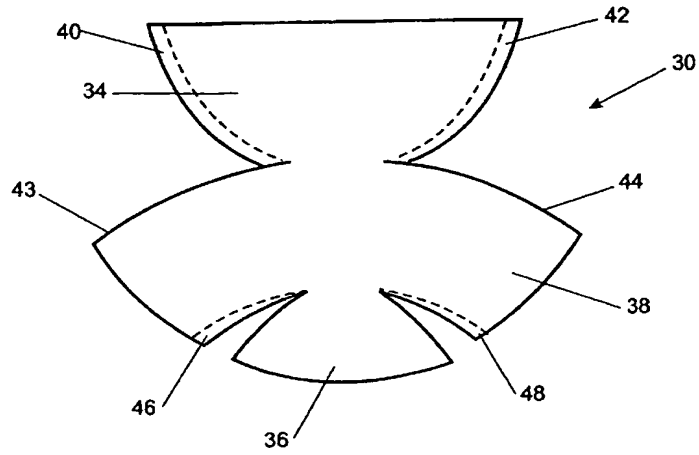
**FIG. 23**



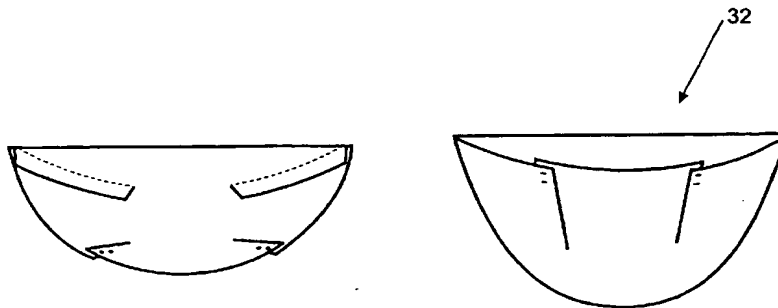
**FIG. 24**



**FIG. 25**

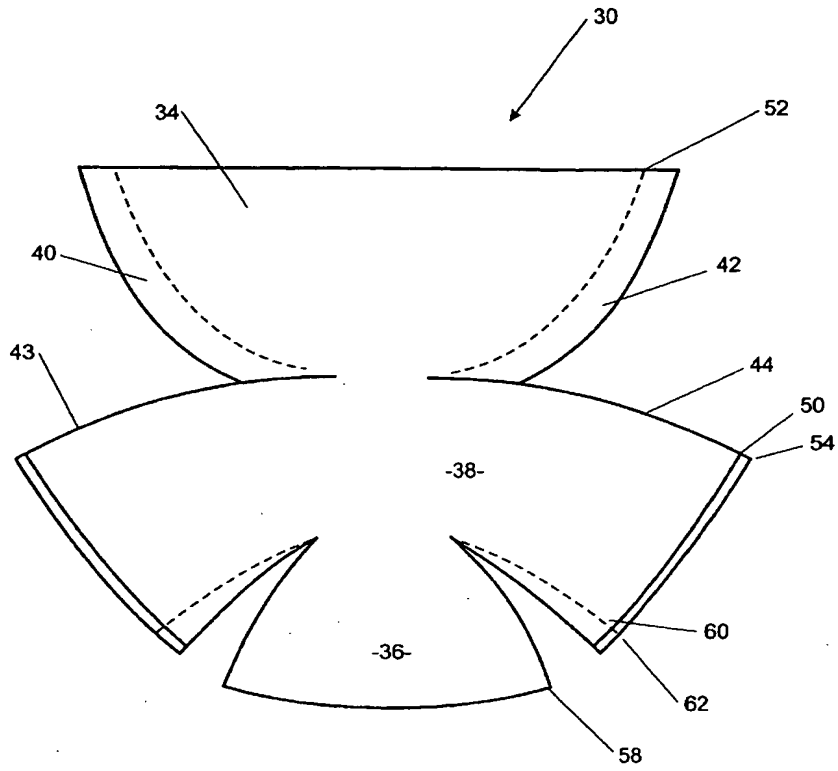


**FIG. 26**

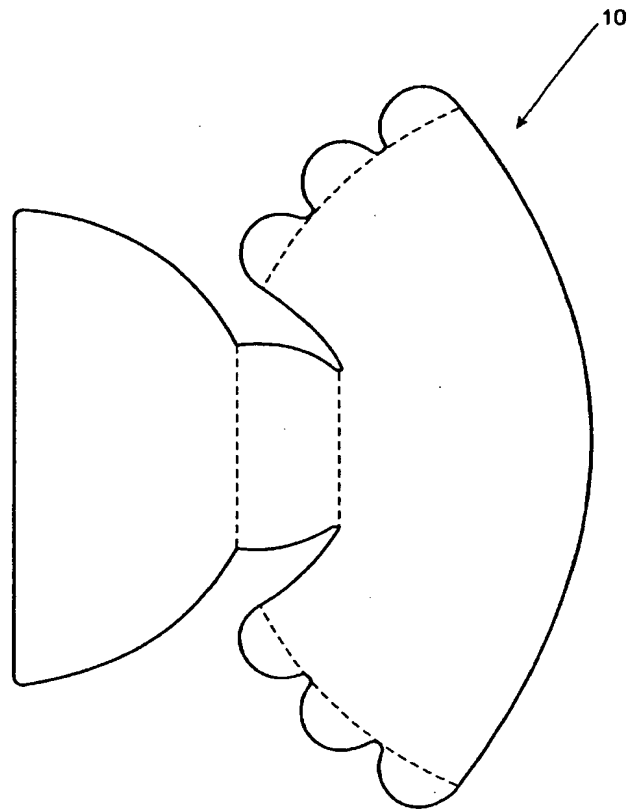


**FIG. 27**

**FIG. 28**



**FIG. 29**



**FIGURE 30**

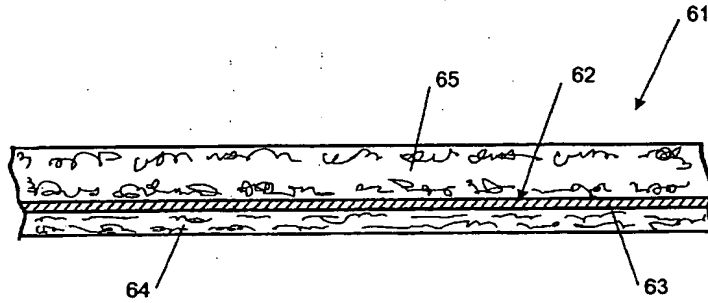


FIGURE 31

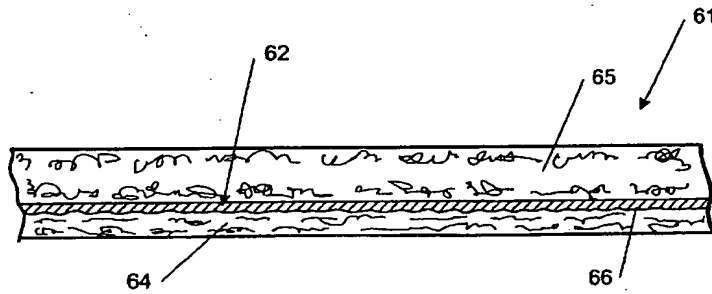


FIGURE 32

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